



10 CFR § 50.73  
L-2011-010

JAN 13 2011

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D. C. 20555-0001

Re: Turkey Point Unit 3  
Docket No. 50-250  
Reportable Event: 2010-006-00  
Manual Reactor Trip and Auxiliary Feedwater Actuation in Response to Loss of  
Circulating Water Pump

The attached Licensee Event Report 05000250/2010-006-00 is submitted in accordance with  
10 CFR 50.73(a)(2)(iv)(A).

If there are any questions, please call Mr. Robert Tomonto at 305-246-7327.

Very truly yours,

Michael Kiley  
Vice President  
Turkey Point Nuclear Plant

Attachment

cc: Regional Administrator, USNRC, Region II  
Senior Resident Inspector, USNRC, Turkey Point Nuclear Plant

IE22  
NRK

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA/Privacy Section (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to [infocollects.resource@nrc.gov](mailto:infocollects.resource@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

With Unit 3 at 100% power, at approximately 0604 on November 15, 2010, the reactor was manually tripped when the 3A2 Circulating Water Pump was stopped due to an overheated packing gland. The manual trip was in anticipation of an automatic turbine/reactor trip on low condenser vacuum. While Auxiliary Feedwater automatically actuated, a train of normal feedwater remained available to feed the steam generators. During the reactor trip, the 3B Steam Dump to Atmosphere valve opened automatically, as designed, but failed to close on operator demand as required by procedure. It was locally isolated with a manual isolation valve stopping the cooldown. The reactor coolant system (RCS) temperature was stabilized at 487°F and borated as required by procedure. The RCS returned to normal operating temperature and pressure and the unit was stabilized in Mode 3. Two root causes were identified: 1) There were inadequate administrative controls for pump packing consolidation for applicable non-nuclear safety (NNS) related pumps, and 2) A healthy skepticism and recognition of risk was not adequately considered or communicated. Corrective actions include: 1) Incorporate information on packing consolidation break-in period, system perturbation information, temperature bands, and minimum/maximum levels for packing leak-off for NNS pumps into the post maintenance testing procedure, 2) implement plan for Recommendation 1 of SOER 10-2: Engaged, Thinking Organizations, 3) inspect Unit 3 and 4 pumps that utilize packing, 4) replace 3A2 CWP pump shaft packing and packing follower, and 5) repair 3B Steam Dump to Atmosphere valve.

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**NARRATIVE****DESCRIPTION OF THE EVENT**

On November 14, 2010, with Unit 3 at 100% power, after completing a recent refueling outage, major maintenance was completed on the 3A2 Circulating Water Pump (CWP) [KE, P] and the pump was started. The following day maintenance was scheduled to be performed on the 3A1 CWP. On November 15, 2010, the 3A1 CWP was stopped and tagged out of service. A system perturbation resulting from stopping the 3A1 CWP caused the 3A2 CWP shaft packing follower to shift, making contact with and rubbing against the pump shaft sleeve. This metal to metal contact created considerable heat, such that approximately 35 minutes after 3A1 CWP was stopped, the operator returning to the area noticed a flame issuing from the 3A2 CWP shaft packing area. A fire was reported and the recommendation to immediately stop the 3A2 CWP was reported to the Control Room. At approximately 0604 on November 15, 2010, the Unit 3 reactor [AC, RCT] was manually tripped and the 3A2 CWP was subsequently stopped. A CO2 fire extinguisher was applied to the pump shaft packing area and then a service water hose was used as a source of cooling for several minutes. Damage was limited to replacement of the 3A2 CWP pump shaft packing and packing follower.

The reactor was stabilized in Mode 3. Auxiliary Feedwater (AFW) [BA] automatically actuated. A train of normal feedwater [SF] remained available to feed the steam generators [SB, SG].

During the reactor trip, the 3B Steam Dump to Atmosphere valve [KE, PCV] opened automatically, as designed, but failed to close on operator demand as required by procedure. It was locally isolated with a manual isolation valve stopping the cooldown. The reactor coolant system [AB] was stabilized at 487°F and was borated as required by procedure. The reactor coolant system returned to normal operating temperature and pressure.

The event was reported (Event Notification 46419) to the NRC in accordance with 10 CFR 50.72(b)(2)(iv)(B) and 10 CFR 50.72(b)(3)(iv)(A). Condition Report 595052 was initiated to determine the causes and corrective actions. This report is submitted in accordance with 10 CFR 50.73(a)(2)(iv)(A).

**CAUSE OF THE EVENT**

Two root causes were identified:

- 1) There were inadequate administrative controls for pump packing consolidation for applicable non-nuclear safety (NNS) related pumps.
- 2) A healthy skepticism and recognition of risk was not adequately considered or communicated.

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**NARRATIVE****ANALYSIS**

The Circulating Water System is an NNS system that provides steam cycle cooling water flow from the cooling canal [BS] through the main condensers [SG, COND]. There are four CWP's for each unit (3 and 4). Each unit requires a minimum of three CWP's for operation at 100% power, but will have better efficiency and produce an additional 7-10 MWe with the fourth CWP in operation. The unit can be operated up to 60% power with two CWP's running, and requires three CWP's running to operate at greater than 60% power.

On November 14, 2010, with Unit 3 at 100% power, after completing a recent refueling outage, major maintenance was completed on the 3A2 CWP, including a rebuilt pump and new motor replacement. New packing was installed, the pump was started and a systematic packing adjustment process commenced. No procedural guidance existed related to the manufacturer recommended break in period of 24-48 hours, which is necessary to ensure successful packing consolidation and proper leakoff is achieved. Previous packing consolidation activities have successfully relied on "skill of the craft" to perform these activities. The packing consolidation period for safety related pumps is governed by procedures.

The following day maintenance was scheduled to be performed on the 3A1 CWP. On November 15, 2010, a decision was made that enough confidence in the recently overhauled 3A2 CWP operation existed to stop the 3A1 CWP and tag the component out of service. This pump shift occurred approximately 15 hours into the pump packing consolidation activities. The Shift Manager performed a visual check of the 3A2 CWP, obtained a status of CWP's from the intake operator, and discussed the packing leak-off status provided by maintenance with the Unit Supervisor.

A system perturbation resulting from stopping the 3A1 CWP caused the 3A2 CWP shaft packing follower to shift, making contact with and rubbing against the pump shaft sleeve. This metal to metal contact created considerable heat, such that approximately 35 minutes after 3A1 CWP was stopped, the operator returning to the area noticed a flame issuing from 3A2 CWP shaft packing area. The condition was reported to the Control Room. Since the unit was above 60% power, the reactor was manually tripped and the 3A2 CWP was subsequently stopped. Damage was limited to replacement of the 3A2 CWP pump shaft packing and packing follower.

Due to low lube water pressure, Turkey Point CWP's are typically repacked very loosely, to ensure adequate cooling flow, as past experience shows packing damage can occur due to over-tightening the gland follower nuts. The loose packing and follower are then monitored and adjusted during wear-in over several days to achieve acceptable stable packing leakage. The loose assembly technique has effectively eliminated inadequate lubrication on startup, but does result in some instability and occasional packing or follower shifting which may result in contact between the gland follower and shaft sleeve. Starting or stopping other CWP's will also change lubricating water flows.

The cause of the 3A2 CWP failure was due to the gland follower shifting and making contact with the pump shaft sleeve. Gland follower shifting was initiated by shutdown of the 3A1 CWP for planned maintenance

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**NARRATIVE**

shortly after major maintenance was performed on the 3A2 CWP. 3A2 CWP packing was still being monitored and adjusted when the decision was made to stop the 3A1 CWP and tag it out of service. The root cause evaluation determined that if the manufacturer recommended break in period (24 hours) for consolidating packing had been formalized, then the schedule would have reflected this and/or this information would have been available prior to the decision to stop 3A1 CWP. Likewise, if a healthy skepticism was clearly present with respect to the inherent risk of the closely scheduled maintenance items, the schedule would have been corrected to provide the additional time for completion of all work on the 3A1 CWP and the event would not have occurred.

Although AFW automatically actuated, a train of normal feedwater remained available to feed the steam generators. The reactor was stabilized in Mode 3 after the reactor trip.

The cooldown due to the 3B Steam Dump to Atmosphere valve failure to close did not exceed allowable limits.

**SAFETY SIGNIFICANCE**

The manual reactor trip was anticipatory to an automatic turbine/reactor trip on low condenser vacuum. With Unit 3 brought to a stable condition in Mode 3 after the reactor trip, the safety significance is very low.

**CORRECTIVE ACTIONS**

Corrective actions include the following:

1. Incorporate information on packing consolidation break-in period, system perturbation information, temperature bands, and minimum/maximum levels for packing leak-off for NNS pumps into the post maintenance testing procedure.
2. Implement plan for Recommendation 1 of SOER 10-2: Engaged, Thinking Organizations.
3. Unit 3 and 4 pumps that utilize packing were inspected. The inspection determined that the remaining pumps had sufficient packing leakoff and gland temperature was normal.
4. The 3A2 CWP pump shaft packing and packing follower were replaced and the pump was returned to service.
5. 3B Steam Dump to Atmosphere valve was repaired and returned to service.

FAILED COMPONENTS IDENTIFIED: None

PREVIOUS SIMILAR EVENTS None